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Measuring the Lotkas's Law Applicability on Human DNA

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Abstract

The study indicates the Quantum of pages of research publications from 1989 to 2013. The total 115584 pages containing 17102 publications during 1989-2013. The highest number of pages 5198 (4.50%) finds out in 736 publications in 1994. The Doubling time (Dt) also appeared a fluctuating trend between 2.67 in 1990 and 69.3 in the year 1996 and 2000 were found to be an upward and downward trend in the period of study. The first is one volume of articles produced by a specific variable (articles in journals) in different years and thus the extent of the increase and the second one is the volume of growth of literature in different years in relation to the world in productivity. At the first observation, it can be analyzed that data invalidate the Lotka's findings that the proportion of all contributions that make a single contribution is less than 60%.

Keywords: Human DNA; Mapping; Relative Growth Rate and Doubling time; Pages wise; Activity Index and Lotka's Law.

Introduction

Deoxyribonucleic acid (DNA) is the universal blueprint for life on Earth, DNA determines what people look like and how their bodies function. It can cause crippling defects or protect living creatures from the disease. It may even determine when it's time to die (Bank E) 1. Studying human DNA and genetics can help scientists better understand where humans came from as a species. Moreover, human DNA and genetics can be intellectually fascinating, but it also has plenty of practical applications.

From the use of DNA testing in court cases to the discovery of new therapies for genetic diseases, a thorough understanding of the human genome can have important medical, social, and legal impacts. Understanding the genetic basis behind human disease is one of the most important reasons for studying the human genome (Coila B 2013).[1]

In the past two decades, very least numbers of studies were published in medical Sciences, consequently this present study helps to know and improve DNA relevant document collect to improve for the library services.

Review of Literature

Li. Q, Jiang.Y, and Zhang. M, (2012)2, analyzed the national contributions in the field of emergency medicine. The study reveals that total numbers of 9775 articles were published in the 13 journals from 2006 to 2010 worldwide. West Europe, North America, and East Asia were the most productive regions. High-income countries published 87.9 of the total articles. The United States published the most number of articles from 2006 to 2010 (46.3), Germany had the highest mean IF (2.27) and mean citations (6.87). Narotsky D, Green PH, Lebwohl B. (2012)3, analyzed CD publication output concerning its degree of diffusion among journals and authors and assessed for an association between economic parameters and output. The study reveals that the number of publications in

CD is increasing, out of proportion to the overall growth of the peer-reviewed medical literature. CD publications are spread throughout a larger number of journals but are more dominated by high-volume authors. Economic factors are associated with national contributions to world literature in CD. Pavlichenkoa.A, and Smirnova. D, (2012)4, examined the socio-demographic profile and clinical manifestations and data of people with mental disorders attending the private psychiatric clinics. The study discusses the social–psychological and neuro-immunological parameters of people with "dangerous" professions.

They use a mathematical method, the authors created a model that can decrease the negative influence of work-related extreme factors. Ugolini D, and et al., (2012)[5], studied that literature in cerebrovascular and cardiovascular disease rehabilitation: growing numbers, reducing impact factor. The study aims to explore temporal trends, geographic distribution, and socioeconomic determinants of scientific production in the field of cerebrovascular and cardiovascular disease (CCD) rehabilitation.

Buttons Garcia-Jover and Barrigon (1992)6 have conducted a study on bibliometric analysis, of publications of Spanish pharmacologists, references within the journals of the Pharmacology & Pharmacy subfield of the Science Citation Index-CD version from 1984 to 1989. The study reveals that the scientific output of Spanish pharmacologists has been growing at a powerful rate being almost doubled. Ambrosio. A, et al., (1993)[7], have discussed a co-word analysis of over 70 years of biological safety literature. The database employed in this project is that the Songer Safety Bibliography (SSB) which lists around 17 000 references.

The results show biological safety to be a fragmented field, characterized by the existence of several relatively independent foci of interest, none of which has been ready to structure the sphere into a good network. Haiqi (1994)[8], has found that bibliometric analysis was examined by the references of the articles in Medicine Chinese Traditional (MCT) searched by the CD-ROM Medline.

The 3006 references of the articles on MCT which were published between 1974 and 1992 in 343 periodicals were the samples for the current study. The result shows that to spot reasonably a hierarchical ranking of periodicals and to gauge objectively a distribution of states where those articles were published and languages within which those articles were written. Herbert. Muller-Hill (1995)[9], observed the research performance of 13 research institutes active within the field of biology. The study purpose to count the number of scientific publications and also the number of citations received during five years (1980–1984). Vickers, (1998)[10], conducted a Bibliometric analysis of the registry of randomized trials of the Cochrane Collaboration field in medicine.

The aim of analyzing, the extent to which they're indexed in Medline, the journals during which they're published, dates of publication, the therapies and conditions most typically form the main focus of study. Baskaran (2013) analyzed that informatics focuses on understanding issues from a stakeholder perspective and applying information and other technologies as needed. That is, it deals with system problems first, not individual technologies in the system. In this regard, informatics considers the technology to be the answer to technical decisions, as it believes that technology is "developed according to its own laws, has its own potential, and is limited only by available material resources." can do.

Baskaran (2013) used a total of 6610 records from the Web of Science to contribute to the academic productivity and research of the encryption fields in four major countries: China, the United States, Taiwan, and Japan. It was analyzed that the distribution of diversity was evaluated and related research areas. Baskaran (2013) argued that doubling time (Dt) tends to increase and decrease in this study. The degree of cooperation and its average value is determined to be 0.963. The three institutions of are productivity leaders.

That is Aragappa University, National Chenking University, Anna University, where CECRI is located. Baskaran and Binu (2019) analyzed that most of the 416 respondents (98.8%) were looking for educational and research information. Research results can determine various parameters of scientific access to electronic resources. Research facilitates the acquisition of electronic information and helps stimulate user research and academic thinking.

Baskaran (2018) investigated the role of computers in the provision of education. Baskaran (2016) discussed the best papers published in the Bioinformatics Journal, and Harvard scientists contributed most of the papers to this study. Both RGR and DT showed this trend throughout the study. Baskaran (2015) investigated the three most important paradigm shifts in 21 library environments. Baskaran (2015) analyzed that US scholars contributed a total of 15832 (30.815%)

of articles, 87.947% of which were published as journals. article. Harvard scientists have received a lot of attention in various research papers and occupy a leading position in research collaboration in the field of enzyme research. Baskaran (2012) argued that doubling time (Dt) tended to fluctuate during the study period. The results use the least squares method to exclude productive authors and the maximum likelihood method to examine the exponential growth of authors. In the process, it was decided that Lotka's law was applicable to graph theory research.

Baskaran and Ramesh (2019) analyzed that the study analyzed that electronic information access patterns between faculty and staff play an important role in performing a variety of tasks for engineering respondents. According to this survey, the survey aims to analyze that 76% of respondents are male, of which 26% are female. Baskaran and Ramesh Babu (2019) investigated the publishing productivity of forensic outcomes from 1989 to 2016. Growth of publications in research, RGR and Dt of research results, cooperation between authors.

Baskaran (2018) analyzed that the highest SD is 21. 71405 and 21.71405 Issues found Missing smartphone and lacking security of personal data. The best resume was 864.5, which was found in the absence of personal data security. Baskaran and Karuilancheran (2015) has a significance level of 29 degrees of freedom at C.V. 0.05, which gives a chi-square (X2) calculation of 5309,368. After that, the performance of researchers began to decline. It was supported by SPI, which is only between 9 and 10. Baskaran (2014) discussed the quantitative analysis of the productivity and characteristics of citations from Library and Information Science (LIS) publications from 2003 to 2012.

A total of 1,942 articles and 12,502 citations have been published in the SSCI-indexed LIS journal. 21.36% of the citations were received in 2012. Baskaran, C. (2013) analyzed that 70(59.1%) of faculty members who participated in the survey learned through 28(56%) guidance from teachers / managers. There is evidence that the majority of faculty and staff, 21(42%), use their department to access information, and 28 (40%) of researchers access their department's e-journals. Baskaran (2019) analyzed 4,444,210 (55.26) respondents who were very happy with OPAC/Web-OPAC. 205 (53.90) respondents are very happy with EDatabases and 192(50.52) respondents are very happy with the automated lending service.

Baskaran (2018) uses the software HistCite to publish on the number of publications, growth rate and doubling time, distribution of publications across journals, publication output, author patterns, and bioremediation research in India. We investigated a map of the impact of this on global quotes. VOS viewer. Indian Institute of Technology, Baba Atomic Research Center, and CSIR are leading producers of research in the field of bioremediation. Sivakami and Baskaran (2016) analyzed a total of 64,030 datasets from the Medline database in this study.

Resources of all types showed the largest decline in 2010 and 2011, with an average of 2,784 publications per year. We conducted a time series analysis of the most productive countries (US) and India and compared the results over the next few years. Baskaran (2014) describes the quality of the collection in terms of books, magazines and resources.

Yahoo is the most popular search engine for internet surfing. Book rental is a favorite of the staff. Saravanan and Baskaran (2019) investigated bibliographic binding, linguistic distribution, keyword distribution, geographical distribution of documents, and a history of local and global citations by established institutions. Analyzed by Bascalan (2019). Most of the 90 (33%), 76 (27.8), and 51 (18.7%) respondents said they "fully agree," "agree," "no comment," "easily accessible," and "prefer." I answered. Analyze large amounts of data. " Baskaran (2018) surveyed most publications in 44.15% of the two authors in the analysis of BM. Guptha has published 18 articles on DJ LIT and is the lead author.

Baskaran, (2013) explored Degree of collaboration and its' mean value is found to be 0.963. The top three institutions with Alagappa University are Central Electro Chemical Research Institute, National Cheng King University, and Anna University. Baskaran and Sivakami, (2014) discussed Quantitative analysis is carried out to identify the literature growth, authorship pattern, collaboration and journal distribution on Swine influenza disease research based on data obtained from Pubmed databases for a period from 2006-2010.

A total of 2360 articles were downloaded from Pubmed database using the search term "Swine*" subjected to bibliometric data analysis techniques. Baskaran (2013) analysed that Information science focuses on understanding problems from the perspective of stakeholders and then applying information and other technologies as needed. In other words, it tackles systemic problems first rather than individual pieces of technology within that

system. In this respect, information science can be seen as a response to technological determination, the belief that technology "develops by its own laws, that it realizes its own potential, limited only by the material resources available, Baskaran (2013) analysed that a total number of 6610 records which were retrieved from the Web of Science was used to assess the academic productivity and distribution of research diversity of cryptography field from four major countries China, USA, Taiwan and Japan which contributed more papers in cryptography and allied field of researches.

Baskaran (2013) discussed that Doubling time (Dt) was found to be increased and decreased trend in this study. Degree of collaboration and its means value is found to be 0.963. The top three institutions with Alagappa University are Central Electro Chemical Research Institute, National Cheng King University and Anna University.

Baskaran and Binu (2019) analysed that Majority of respondents 416 (98.8%) are searching for educational and research Information. The findings of the study could identify the various parameters while access Electronic resources by the academic community. The study would helpful to bring to access Electronic Information for momentum of gain research and academic ideas among the users. Baskaran (2018) examined that computers became involved in the delivery of education, a proposed definition identifies the delivery of instructional materials, using both print and electronic media. Baskaran (2016) discussed the highest publication published in Bioinformatics journal and Harvard University scientists contributed highest number of publication in the study.

RGR and DT is exhibits that fluctuating trend happening whole period of study. Baskaran (2015) studied the three Major Paradigm Shifts 21st Century Library Setting, Revolutionary Changes, Library Roles, Millennial Generation, Cyber Infrastructure Characteristics, Major Challenges of 21st Century Librarian, Tasks, Library Should Be, the researchers expectations and so on. Baskaran (2015) analyzed the USA scientists have contributed totally 15832 (30.815%) items and include 87.947% percent are appeared as journal articles. Harvard University scientists are much attention in produced large number of research papers and they hold top level among research collaboration in enzyme research.

Baskaran (2012) discussed that Doubling Time (Dt) has shown as fluctuating trend during the period of study. The result examined the author exponential growth using least squares excluding high productive authors and maximum likelihood method. Lotka's law is found to be applicable to graph theory research during the study period. Baskaran and Ramesh (2019) analyzed that The study analyses Electronic information access pattern among the faculty members is the significant role in the Engineering institutions towards various tasks to fulfil by the respondents. The study aim to analyze that 76 percent of the respondents are male and 26 percent of them are female observed from the study.

Baskaran and Ramesh Babu (2019) examined the publication productivity of Forensic Medicine output during 1989-2016. The growth of the publications, RGR and Dt of the research output, Collaboration of authors, Collaborative co-efficient etc. in the study. Baskaran (2018) analyzed the highest SD was 21. 71405 and 21.71405 the problems were found Do not have smart Phone and Lack of security on personal information. The highest CV was 864.5 found on Lack of security on personal information. Baskaran and Karuilancheran (2015) analyzed the C.V. at 0.05 significant level for 29 degrees of freedom is 42.56 and the calculated value of Chi-Square (X2) obtained in this case is 5309.368.

Afterwards, the performance of researchers started diminishing. It was supported by SPI that ranges between 9 and 10 only. Baskaran (2014) discussed the quantitative analysis of the productivity and characteristics of citations of Library and Information Science (LIS) publications during 2003-2012. A Total of 1942 contributions published and 12102 citations received in the LIS journals indexed in SSCI. 21.36% of citations were received in 2012. Baskaran, C. (2013) analyzed that faculty members who respondents to the study, 70 (59.1%) learned through guidance from their teachers/guide 28 (56%). It is proved that the highest proportion of faculty member, 21 (42%), use their department for accessing the information, while 28 (40%) of the research scholars were accessing their e-journals in their department itself.

Baskaran (2019) analyzed the 210 (55.26) respondents are extremely satisfied on OPAC/ Web OPAC. 205(53.90) respondents are extremely satisfied on E-Databases, 192(50.52) respondents are extremely satisfied on Automated circulation services. Baskaran (2018) explored the map the number of publications, growth rate and doubling time, scattering of publication over journals, and its impact on publication output, authorship patterns and Global citation score of bioremediation research publication in India using the HistCite, VOSviewer software. Indian Institute of technology, Baba atomic research centre and CSIR are the major producers

of research output in the area of bioremediation. Sivakami and Baskaran (2016) analysed that total of 64030 records were obtained from Medline databases have been taken for this study. All kinds of resources are fallen in highest in the year 2010 &2011 with average publications of 2,784 per year. The Time series analysis ware carried out for the top most productive country (USA) and India to compare the research output in forth coming years. Baskaran (2014) discussed quality of collection with respect to books, Journals and e-resources. Yahoo is most popular search engine among the user for browsing the net. Book lending service is the most prefer by the staff.

Saravanan, and Baskaran (2019) examined the identifies bibliographic coupling of the institution, language distribution, keyword distribution, geographical distribution of the literature and Historiography on Local and Global Citation is also analyzed. Baskaran (2019) analyzed the majority 90 (33%), 76 (27.8) and 51 (18.7%) of the respondents of them recorded that "Strongly Agree", "Agree", and "No Comment" respectively to prefer "Easy to access massive amount of data to analyse".

Baskaran (2018) examined the majority of publications 44.15% representing by the two authors in the analysis BM. Guptha was published 18 papers in DJLIT, who is a ranked 1 author. It followed by Chenupathi K. Ramiah shored second his publications 11. University of Delhi, which is the top ranked institution. Binu and Baskaran (2017) analyzed the assess the user satisfaction with respect to the eresources and services.

It reveals that majority of respondents are using e-resources at large extent or very large extent for different purposes. Users' satisfaction level is very high with respect to various electronic resources and services available in the library. Ramesh Babu and Baskaran (2017) analyzed the analyses that research growth trend of Forensic Medicine during 1989-2015. It is observed highest out of Forensic Medicine research Forensic Medicine research in 2013 was 447 (11.05 %) of the publications, followed by 420 (10.38%) of the publication brought out in 2015. the doubling time of the publications also a fluctuate trend appears whole study period.

Baskaran (2020) analyzed the lowest relative growth rate (RGR; 0.04) was found in 2008. 2010, 2012, and 2014 RGR rose up to 0.75 in 1990, and the average mean value of relative growth rate (RGR) is 0.15. The highest number of publications (293; 63.55%) accumulated from information science library science. This area has been ranked first among 21 research fields listed in the study. Baskaran (2020) describes Altmetrics use in public APIs across platforms to gather data with open scripts and algorithms. Altmetrics did not originally cover citation counts. It calculated scholar impact based on diverse online research output, such as social media, online news media, and online reference managers. Baskaran, C. (2020) analyzed the 11,941 total records on social networks and media retrieved from Web of Science database during the period of study. Palanivel and Baskaran (2018) studied the 2313 scholarly communications published in the Economic Affairs Journal.

The analysis cover mainly the number of articles, form of document, the study is obtained from the Scopus database in 2313 results for thirty seven years in this results retrieved are analyzed using excel worksheets. Pramanathan and Baskaran (2015) discussed the 199 (49.13%) and 131 (43.52%) of the respondents were female respondents from Bharathidasan University and Periyar University. Majority of the 310 (76.54%) and 198 (65.78%) of the respondents who have got research experience below 3 years from Bharathidasan and Periyar university.

Murugaiah and Baskaran (2013) analyzed the high number of papers was collaborated with United States researchers in the field of Human DNA. The study measures the performance based on several parameters, country year-wise growth rate, authorship pattern, collaborative index, collaborative coefficient, leading collaborative countries and authors have contributed publications in Human DNA research. Baskaran (2020) discussed the maximum 290 (12.20%) of the publications contributed by the researchers from Central Electro chemical Research Institute was highly collaborated with Alagappa Universities , which has top Citations and h-Index 3852 and 32 respectively.

The propounded according to Google Scholar Metrics (GSM) SK Pandian was to be a top ranked researcher, despites his year wise citations shows 4491 and h-Index credited 36 during 2008-2018. Ramesh and Baskaran (2019) analyzed the respondents "Satisfied" with e-resources offering lecturing materials. This data presents that a large number of respondents 265 (51.0%) prefer gateway portal to a "Large Extent' and 139 (26.7%) of the respondents prefer to a "Very Large Extent".

On the other hand, it has also been noticed that 105 (20.2%) of the respondents are "Less satisfied" whereas 11 (2.1%) of the respondents opted "No Comment". Baskaran (2018) discussed the majority of 63 (27.6%) specified "Aware" and Usage of

Whatsapp, 53 (23.2%) You Tube, 47 (20.6%) Google+, 46 (20.2%) Face Book, 23 (10.1%) Tumbler/ Messenger, 21 (9.2%) Twitter, 18 (7.9%) Others and 17 (7.5%) Instagram. Functions appropriate to their parent institutions.

Baskaran (2021) analyzed the majority 134 (1.96%) of the publications contributed by the researchers from the University of California systems. Zhang Y was the top author has contributed 16(0.23%) of the publications in the field of Web 2.0, subsequently, Kolt GS, Li Q, Vandelantte C, Zhang J, the publications equally appears 13(0.19%) of the publications. Baskaran and Pitchaipandi (2021) analyzed the respondents highly prefer group sites (Yahoo, Google, and Whatsapp). The research analyses that social media tools for research the majority of the respondents highly preferred Facebook wall for shared the research information by the respondents in the eight Universities in Tamil Nadu.

Pitchaipandi and Baskaran (2021) examined the 51.3% of the respondents visit 1/hr day in using WhatsApp. 78.9% of the respondents added the Whatsapp Groups from Friends of the respondents respectively. Among the WhatsApp as instructive help devices and administrations in a Thiruvalluvar University. Baskaran (2020) analyzed that there are twenty five institutions are listed, among them University of Washington has contributed highest 48 (0.98%) of the publications witnessed be a first position out of twenty five.

Radhakrishnan and Baskaran, C. (2020) discussed there is a moderate correlation between Citation and Altmetric Score. Only one paper obtains citation and Altmetric score equally. Another paper gets citation and Altmetric score in near equal. Out of the 10 papers, four papers received more citations. Of the 4 highly cited articles, three papers receive very low Altmetric score and only one paper receives high Altmetric score.

Baskaran and Binu (2020) discussed that majority of respondents 109 (21.9%) are post graduates and 75 (17.8%) are having PG with NET qualification. Mean value for 'To borrow books' was 3.86 and assigned the rank one. Majority of respondents 416 (98.8%) are searching for educational and research Information. The findings of the study could identify the various parameters while access Electronic resources by the academic community. Baskaran and Ramesh (2020) analyzed that Two hundred fifty-one (48.3%) respondents rated that information sought from e-books are "excellent" while 205 (39.4%) of the respondents rated them as "very good." Two hundred eighty (53.8%) respondents "agree" that electronic journals save the time of the user while 219 (42.1%) of the respondents "strongly agree." A miniscule number, 21 (4.0%), respondents "disagree." Baskaran, C. (2020) discussed that Currently, ROAR lists 1,793 and Open DOAR lists about 1,966 IRs all over the world. It is found that more institutions (47) installed the D-Space (62%). It is followed by e-prints adopted (26), and two institutions implemented OAR through GSDL. Ramesh, P and Baskaran, C. (2019) analysed that at a large number of respondents 265 (51.0%) prefer gateway portal to a "Large Extent'and 139 (26.7%) of the respondents prefer to a "Very Large Extent". On the other hand, it has also been noticed that 105 (20.2%) of the respondents are "Less satisfied" whereas 11 (2.1%) of the respondents opted "No Comment".

Radhakrishnan and Baskaran (2019) analyzed that square root of total authors, who have contributed 7.94 % of the total contribution, is found to be 215.52 in Price square Root Law. The Pareto's 80/20 rules state that 20% of the authors contributed only 46.60% of the total contribution. Baskaran and Babu, P. R. (2019) discussed the activity index and exponential growth of authors analysed during 1989-2016. The result of the study found that publications growth between 11 (0.26%) in 1989 and 447 (10.76%) in 201.

RGR shows a fluctuates trend between 0.02 and 1.02 in 2005, 2006 and 1991 respectively. Complete twenty three years the research could be observed that RGR less than 1. Baskaran, C. (2018) discussed that highest of 2093 (13.94%) citations received by Prof. Sanjeeviraja out of 180 (11.41%) of the Publications during the period. Material Science has 5632 Citations for 488 Publications with the highest h-index was 37. Baskaran and Rameshbabu (2018) conducted the study largest output in was found 447 publications in 2013. It is found the DC between 0.64 and 0.94 and overall DC measured to be 23.08 throughout study period. The study could be found DC was an increased and a decreased trend appeared in the whole study period.

Value n in the field of Forensic Medicine is being analysed, it has calculated the exponential growth is n= 4.4320914 for author. Radhakrishnan and Baskaran (2018) discussed that maximum number of articles 114 (4.83%) were published in the year of 2015. In the Authorship Pattern, the major contribution of articles was from two authors 776 (32.87%). The Time series analysis technique reveals the estimated future growth of articles in the Journal will be increased from 63.81 (2016) to

88.13 in 2020 and 93.66 in the year 2021. Murugiah and Baskaran (2014) analyzed the document types, journal articles were the highest numbers with 7210 papers or 99.26%. From this study, it is observed that the Journal of Biological Chemistry has published with 529 research papers and find top position which is accounted for 7.28% of the total articles. Sivakami and Baskaran (2014) analyzed that kinds of resources are fallen in highest in the year 2010 & 2011. Collaborative authors' productivity is more than a single contribution. The degree of collaboration C= 0.884 represents 88 percent of collaborative authors article that were published during the study periods. Bradford's law fits well on sample. Baskaran, C. (2013) examined the Doubling time (Dt) was found to be increased and decreased trend in this study.

Degree of collaboration and its means value is found to be 0.963. The top three institutions with Alagappa University are Central Electro Chemical Research Institute, National Cheng King University and Anna University. Veeramuthu and Baskaran (2018) analyzed the maximum articles 568 were published in the year 1999 and the minimum 46 in the year 1995. In the authorship pattern, the maximum articles 5131 were published by single author. The RGR in the starting year 1990 is 0.78 and 0.03 in the last year 2017. The Doubling time in the starting year 1990 was 0.88 and in the last year 2017 for 27.47. Baskaran, C. (2011) analyzed the Author's collaboration analyzed through Subramanian's formula and it expressed C= Nm/ Nm+ Ns.

Lotka's law and bradford's law of scattering were applied to count the author productivity and core journals in this specific subject. Lotka's law is n= 2 and Bradford's law scattering 1: n: n2. These have been analysed in this study. Pitchaipandi and Baskaran (2020) investigated the social Networks and Media exchange information, ideas and pictures/videos in virtual communities and networks.

The assessment of this study was the role and consumption of Social Networks/Media Research Communication by the Students and Research Scholars' Social Science at Alagappa University, Karaikudi, Tamilnadu. Senthil Kumar and Baskaran (2018) discussed the Journal named "Advanced Materials Research" ranked in the top position in contributing articles 59 (2.28%) in this field. The highly prolific author is Monteiro S.N who has contributed 41 articles 0.47%. Krishnan and Baskaran (2018) studied the maximum articles 1084 were published by four authors. The RGR in the starting year 2000 is 0.71 and 0.12 in the last year 2017. The Doubling time in the starting year 2000 was 0.98 and in the last year 2017 was 5.96. In the Country wise distribution of articles, the major contribution was from China 1381 (19.21%). Baskaran, and Anbu, S. G. (2011) attempt to the internet based resources by the students of Hindustan college of Engineering, Chennai (India). The aim is to determine the use of Internet based resources by the students skills in handing the different types of documents can access to academic and various purposes. This survey reflects the availability of e-resources and typically examines the quantum of their use in Hindustan college of Engineering.

Objectives of the study

- To analyze the quantum of Page –wise research pattern on the publications in human DNA during 1989-2013.
- To examine the RGR and Doubling time of Pages wise publications during 1989-2013.
- To observe the activity index of world output of human DNA research output.
- To test the applicability of Lotka's law of author productivity in the field of human DNA.

Methodology

The publications are retrieved from the Scopus database on 'Human DNA' research covering the period from 1989 to 2013. Further, the researcher has downloaded the bibliographical data in the form of notepad files; then the bibliographical details are converted to the form of Microsoft office excel format using the PHP (Hypertext preprocessor) scripting language text extracting based on delimiters program. Finally, the unique data are rearranged in Microsoft office excel format to eliminate duplication of the downloaded data. The overall data retrieved 17112 publications, 10 duplicate publications removed by the researcher finally 17102 publications have for analyzing the present study.

Quantum of pages of the research publications in human DNA research

The analysis of the number of pages of publications in Human DNA research output during the period of study. It is observed from Table 1, year-wise output of human DNA research indicates the Quantum of pages of research publications from 1989 to 2013. It is found that 115584 pages

containing 17102 publications during the period. The highest number of pages of 5198 (4.50%) find out in 736 publications in 1994, followed by 4988 (4.32%) of the pages found out in 686 publications in 2001. It concludes that the overall pages of the publications range between 3829 (3.31%) appeared in 597 publications in 1989 and 5197 (4.50%) of paper appeared in 736 publications in 1994. It is found that in general, when to increase the growth of the publication simultaneously pages growth is also to be increased. It is noted that the same trend did not appear in this case that the fluctuating trend has appeared during the study.

Table 1: Quantum of pages of the research publications in human DNA research.

Year	No. of Publications	No. of Pages	Percentage	Cumulative Percentage
1989	597	3829	3.31	3.31
1990	675	4981	4.31	7.62
1991	712	4299	3.72	11.34
1992	673	3927	3.40	14.74
1993	733	4441	3.84	18.58
1994	736	5198	4.50	23.08
1995	767	4732	4.09	27.17
1996	756	4803	4.16	31.33
1997	734	4907	4.25	35.57
1998	727	4504	3.90	39.47
1999	736	4744	4.10	43.57
2000	681	4719	4.08	47.65
2001	686	4988	4.32	51.97
2002	674	4661	4.03	56.00
2003	673	4654	4.03	60.03
2004	660	4887	4.23	64.26
2005	662	4721	4.08	68.34
2006	619	4513	3.90	72.25
2007	615	4640	4.01	76.26
2008	630	4581	3.96	80.22
2009	688	4775	4.13	84.35
2010	616	4185	3.62	87.98
2011	639	4021	3.48	91.45
2012	720	4977	4.31	95.76
2013	693	4897	4.24	100.00
Total	17102	115584	100.00	

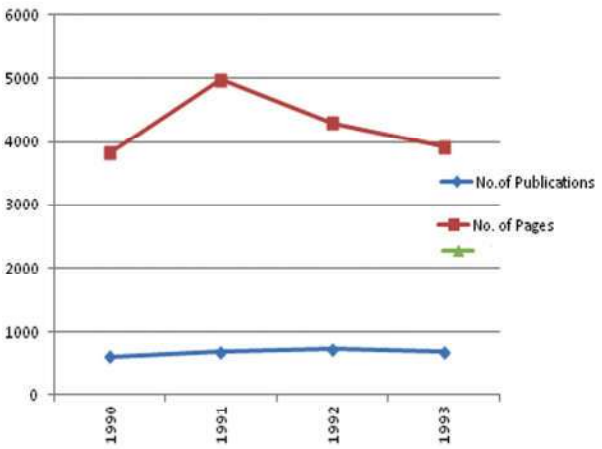

Fig. 1: Quantum of pages of the research publications in human DNA research.

Relative Growth Rate (RGR) and Doubling Time (Dt) of Pages

Table 2 observed that, Relative Growth Rate (RGR) and Doubling Time (Dt) for the pages of the publications in human DNA research. The Relative Growth Rate was observing that fluctuating trend range between 0.01 in 2000 and 0.26 in 1991. The Doubling time (Dt) also appeared a fluctuating trend between 2.67 in 1990 and 69.3 in the years 1996 and 2000 were found to be an upward and downward trend in the period of study.

An average mean of Relative Growth Rate (RGR) and Doubling Time (Dt) were 0.07 and 17.41 respectively. It could be observed that the Relative Growth Rate and Doubling Time (Dt) are shown that a fluctuating trend shows in pages output.

World output Vs. Journal Article (J A) of Activity Index

Table 3 shows that the Activity Index of the journal output and world output of Human DNA research. It is observed that research out of the journal articles from 560 in 1989 and rose up to 698 publications in 1996, suddenly the activity index appeared that an increase and a decreased trend throughout the period. It is found that the Activity Index of articles in journals, the proportion of contribution to productivity, and in terms of growth is seen from two different angles. The first is one volume of articles produced by a specific variable (articles in journals) in different years and thus the extent of the increase and the second one is the volume of growth of literature in different years in relation to the world in productivity. It could be observed that the result the of Activity Index witnessed the

Table 2: Relative Growth Rate (RGR) and Doubling Time (Dt) of Pages.

Year	No. of Pages	Cum. Pages	W1	W2	W1-W2 R(a)	Mean (a) 1-2	Doubling time	Mean dt (a) 1-2
1989	3829	3829		8.25				
1990	4981	8810	8.25	8.51	0.26		2.67	
1991	4299	13109	8.51	8.36	0.15		4.62	
1992	3927	17036	8.36	8.27	0.09		7.7	
1993	4441	21477	8.27	8.39	0.12	0.15	5.78	5.19
1994	5198	26675	8.39	8.55	0.16		4.33	
1995	4732	31407	8.55	8.46	0.09		7.7	
1996	4803	36210	8.46	8.47	0.01		69.3	
1997	4907	41117	8.47	8.49	0.02		34.65	
1998	4504	45621	8.49	8.41	0.08	0.07	8.66	24.92
1999	4744	50365	8.41	8.46	0.05		13.86	
2000	4719	55084	8.46	8.45	0.01	0.03	69.3	20.92
2001	4988	60072	8.45	8.51	0.06		11.55	
2002	4661	64733	8.51	8.44	0.07		9.9	
2003	4654	69387	8.44	8.44	0		0	
2004	4887	74274	8.44	8.49	0.05		13.86	
2005	4721	78995	8.49	8.45	0.04		17.33	
2006	4513	83508	8.45	8.41	0.04		17.33	
2007	4640	88148	8.41	8.44	0.03		23.1	
2008	4581	92729	8.44	8.42	0.02	0.03	34.65	21.25
2009	4775	97504	8.42	8.47	0.05		13.86	
2010	4185	101689	8.47	8.33	0.14		4.95	
2011	4021	105710	8.33	8.29	0.04		17.33	
2012	4977	110687	8.29	8.51	0.22		3.15	
2013	4897	115584	8.51	8.49	0.02	0.09	34.65	14.78
Total	115584				1.82	0.07		17.41

higher activity and lower activity found to be a 96 in 2003 and 104 in 1989.

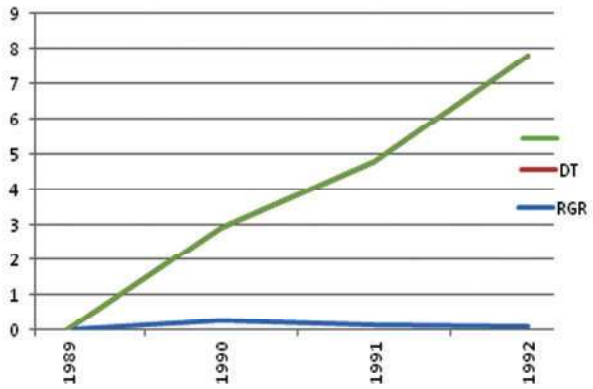

Fig. 2: Relative Growth Rate (RGR) and Doubling Time (Dt) of Pages.

Single authored Vs. Multi authored papers in human DNA research

It has been analyzed the authorship pattern of the publications in human DNA research. It is a major aspect of the research that evaluates the single and multi-authored papers of the publications. The analysis is helping to identify the research dimension on the authorship pattern in any discipline. Table 4 shows that, year wise and single Vs. multi authors research output in Human DNA output.

It is found that 747 (4.37%) of publications were contributed by single authors and the remaining 16355 (95.63%) of the publications have contributed by multi-authored, also noted that a maximum of 46 papers was contributed by a single author in 1995.

It is noted that over 95% of the publications shared in collaborative nature. It is also found that the degree of collaboration of authors from 93 to 98 and it is also observed that the Degree of Collaboration appeared that upward trend throughout the study period. The average value of the Degree of Collaboration is 0.96.

Table 3: World output Vs. Journal Article (J A) of Activity Index.

Year	R. Output of J A	COP = A	World output	WOP = B	A/B	AI Value
1989	560	0.036	597	0.035	1.04	104
1990	603	0.039	675	0.039	1.00	100
1991	646	0.042	712	0.042	1.00	100
1992	601	0.039	673	0.039	1.00	100
1993	640	0.042	733	0.043	0.97	97
1994	661	0.043	736	0.043	1.00	100
1995	680	0.044	767	0.045	0.99	99
1996	698	0.045	756	0.044	1.03	103
1997	662	0.043	734	0.043	1.00	100
1998	656	0.043	727	0.043	1.00	100
1999	679	0.044	736	0.043	1.03	103
2000	607	0.039	681	0.040	0.99	99
2001	619	0.040	686	0.040	1.00	100
2002	596	0.039	674	0.039	1.00	100
2003	578	0.038	673	0.039	0.96	96
2004	574	0.037	660	0.039	0.97	97
2005	589	0.038	662	0.039	0.99	99
2006	562	0.037	619	0.036	1.01	101
2007	546	0.036	615	0.036	1.00	100
2008	563	0.037	630	0.037	1.00	100
2009	625	0.041	688	0.040	1.01	101
2010	561	0.037	616	0.036	1.01	101
2011	588	0.038	639	0.037	1.02	102
2012	651	0.042	720	0.042	1.00	100
2013	623	0.041	693	0.041	1.00	100
	15368		17102			

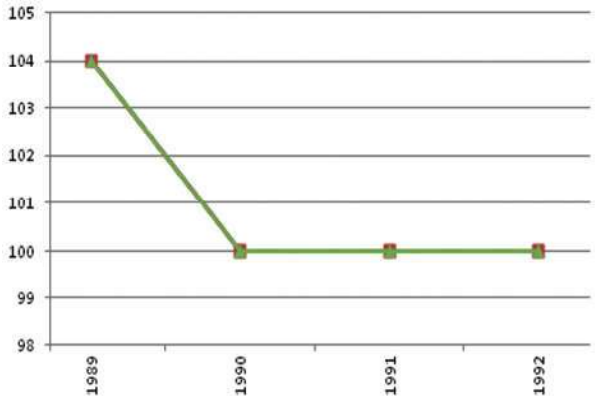

Fig. 3: World output Vs. Journal Article (JA) of Activity Index.

Table 4: Single authored Vs. Multi authored papers in human DNA research.

Year	Single Author	Per-centage	Multi Author	Per-centage	World Output	Degree of Colla-boration
1989	42	0.25	555	3.25	597	0.93
1990	44	0.26	631	3.69	675	0.93
1991	40	0.23	672	3.93	712	0.94
1992	37	0.22	636	3.72	673	0.95
1993	43	0.25	690	4.03	733	0.94
1994	45	0.26	691	4.04	736	0.94
1995	46	0.27	721	4.22	767	0.94
1996	39	0.23	717	4.19	756	0.95
1997	36	0.21	698	4.08	734	0.95
1998	30	0.18	697	4.08	727	0.96
1999	30	0.18	706	4.13	736	0.96
2000	26	0.15	655	3.83	681	0.96

2001	34	0.20	652	3.81	686	0.95
2002	31	0.18	643	3.76	674	0.95
2003	19	0.11	654	3.82	673	0.97
2004	24	0.14	636	3.72	660	0.96
2005	21	0.12	641	3.75	662	0.97
2006	15	0.09	604	3.53	619	0.98
2007	20	0.12	595	3.48	615	0.97
2008	27	0.16	603	3.53	630	0.96
2009	16	0.09	672	3.93	688	0.98
2010	16	0.09	600	3.51	616	0.97
2011	18	0.11	621	3.63	639	0.97
2012	23	0.13	697	4.08	720	0.97
2013	25	0.15	668	3.91	693	0.96
Total	747	4.37	16355	95.63	17102	0.96

Table 5: Lotka's law of author productivity.

No. of Publ-ication	Observer no. of Authors with n (an) or F	Observed% of authors 100/ an/a1	Expected No. of authors (an=a1/ n2) P	Expected% of authors predicated by Lotka's /100n	(F-P)2/P
1	79883	100.000	79883.00	100.00	0
2	2104	2.634	19970.75	25.00	15984.41
3	359	0.449	8875.89	11.11	8172.41
4	216	0.270	4992.69	6.25	4570.03
5	96	0.120	3195.32	4.00	3006.20
6	68	0.085	2218.97	2.78	2085.06
7	34	0.043	1630.27	2.04	1562.97
8	26	0.033	1248.17	1.56	1196.71
9	21	0.026	986.21	1.23	944.66
10	11	0.014	798.83	1.00	776.98
11	14	0.018	660.19	0.83	632.49
12	4	0.005	554.74	0.69	546.77
13	4	0.005	472.68	0.59	464.71
14	5	0.006	407.57	0.51	397.63
15	7	0.009	355.04	0.44	341.17
16	5	0.006	312.04	0.39	302.12
17	3	0.004	276.41	0.35	270.44
18	6	0.008	246.55	0.31	234.70
19	1	0.001	221.28	0.28	219.29
21	2	0.003	181.14	0.23	177.16
22	2	0.003	165.05	0.21	161.07
25	3	0.004	127.81	0.16	121.88
26	4	0.005	118.17	0.15	110.31
28	1	0.001	101.89	0.13	99.90
29	2	0.003	94.99	0.12	91.03
30	1	0.001	88.76	0.11	86.77
31	1	0.001	83.12	0.10	81.14
34	1	0.001	69.10	0.09	67.12
42	2	0.003	45.29	0.06	41.37
Total	82886			X^2	1526.66

Lotka's law of author productivity

Table 5 indicates the author's productivity in human DNA research output. The analysis of data invalidates Lotka's findings that the proportion of all contributions that make a single contribution is less than 60 % at first observation. Further, Lotka's Chi-square model confirms the source trend. It explains the fact that the calculated X2 value is 1526.66 which is less than its tabulated value at a 5 percent level of significance.

Thus the present analysis clearly invalidates Lotka's findings. In the present analysis, productivity is attributed to several factors. If complete publication details of an author are taken, the Lotka's law testing may present a different picture. In this study, the research productivity of human DNA literature is examined. At the first observation, it can be analyzed that data invalidate the Lotka's findings that the proportion of all contributions that make a single contribution is less than 60%.

Conclusion

The output of six continents African countries published the least number of publications in human DNA research, South America and Oceania countries also produced a less number of publications in this research. In this connection, the government of the least number of publications published countries should allocate more funds for DNA research. There is a need to encourage and motivate collaborative research of human DNA among the European, North American, and Asian scientists and other scientists of Oceania, South American, and African countries.

In order to improve the quality of human DNA research, European scientists should be deported to developed countries to undergo training programs with a view to increasing the skill and efficiency of the scientists. Oceania, South American, and African countries' scientists may be motivated to produce a number of publications on human DNA research based on the present study. Based on the findings, the neglected areas of human DNA research may be identified, so that the scientists may be encouraged to carry out more research activities in those areas of human DNA research. From the inferences of the present study, the productivity of the author can be identified. Therefore, the individual scientist may be stimulated to publish more contributions instead of a single author's contribution. Moreover, the present study may serve as a beacon light to information seekers.

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